

PREVALENCE OF OBESITY IN A GROUP OF ELDERLY

Gherbon Adriana MD, PhD, Assistant Prof.

Department of Physiology and Immunology

University of Medicine and Pharmacy Victor Babes, Timisoara, Romania

Abstract

Background&Aims: Obesity, particularly abdominal obesity, represents one of the cardiovascular risk factors. Data existing in literature, suggest that the prevalence is more than twice as high at age 55 as at age 20 and most affected are women. The purpose of this study is to asses the prevalence of obesity at elderly aged above 60 years, and association with other cardiovascular risk factors. **Methods:** The study group was represented by 438 elderly subjects (267 female and 171 male) aged above 60 years. Were used clinical and biochemical parameters. **Results:** 29% had BMI above 30 kg/m^2 (33.7% F and 21.63% M, $p=0.006$, $X^2=7.38$). 3.2% had BMI $< 18.5 \text{ kg/m}^2$, 34.01% had BMI between 18.5 and 24.9 kg/m^2 , and 33.79% BMI between 25 and 29.9 kg/m^2 (55.4% F and 44.6% M, $p=0.06$, $X^2=7.38$). In function of obesity grade, 71.65% had obesity grade I (65.93% F and 34.07% M, $p<0.001$, $X^2=18.48$), 19.68% obesity grade II (80% F and 20% M, $p<0.001$, $X^2=18$ and 8.66% obesity grade III (90.9% F and 9.1% M, $p<0.001$, $X^2=14.73$). From obese and overweight subjects, 26.9% had fasting glycemia above 100 mg%, 41.45% had higher concentration of total cholesterol, 26.54% had higher concentration of triglyceride, and 66.18% had hypertension. **Conclusions:** At elderly we have a predominance of obesity at female. In function of obesity grade, and type we have a predominance of obesity grade I, android type. Because of association with other cardiovascular risk factors it's imposed early measures for decreased obesity prevalence and changing lifestyle.

Keywords: Prevalence, obesity, elderly

Introduction

Obesity is defined as an unhealthy excess of body fat, which increases the risk of medical illness and premature mortality.

The prevalence of obesity is increasing in all age groups, including older persons.

Numerous epidemiological studies have revealed a large and growing frequency of overweight and obesity in the population in the vast majority of developed and developing countries. Despite the fact that persons ≥ 60 years of age comprise the fastest growing group in economically more advanced countries, most of those studies have been limited to the adult population under 65 years of age (WHO, 1998).

One characteristic of the epidemiology of obesity is the extraordinary variability in its prevalence among different populations. This phenomenon is most notable in the elderly population, perhaps due to the greater difficulties in correctly obtaining anthropometric measurements in individuals as they grow older. As shown by Launer et al., the frequency of overweight in the population 70–79 years varies enormously among countries, from 0% in some Asian and African populations to 35% in Greece (Launer et al, 1996). Other studies that include the elderly in different countries also show the large variability in the prevalence of overweight and obesity in this population group (Villareal et al, 2005).

Obesity, particularly abdominal obesity, represents one of the cardiovascular risk factors. Data existing in literature, suggest that the prevalence is more than twice as high at age 55 as at age 20 and most affected are women.

Obesity causes serious medical complications and impairs quality of life. Moreover, in older persons, obesity can exacerbate the age-related decline in physical function and lead to frailty. Other important factors related to aging are the anthropometric and nutritional aspects (McGee, 2005; Jee et al, 2006). Among the elderly there is a loss of the lean body mass and increased body-fat percentage. Changes may occur such as height loss (Perissinotto et al, 2005), kyphosis, relaxation of the abdominal muscles and decreased elasticity of the skin, which contributes to the accumulation of central fat (Enzi et al, 1986; Perissinotto et al, 2005). Furthermore, physical inactivity tends to increase with aging, which is a major risk factor for non communicable diseases and mortality, especially cardiovascular disease, the leading cause of death among the elderly (Pate et al, 1995; Cabrera et al, 2012; Flegal et al, 2013).

Obesity increases the risk of developing co morbidities such as diabetes, dyslipidemia and hypertension that limit their quality of life.

However, appropriate treatment for obesity in older persons is controversial because of the reduction in relative health risks associated with increasing body mass index and the concern that weight loss could have potential harmful effects in the older population. (Villareal et al, 2005)

However, it is difficult to accurately measure body fat mass in most clinical settings, because this assessment requires the use of sophisticated technologies that are not readily available. Therefore, BMI, calculated as

body weight (in kg) divided by the square of height (in m), has been widely used and accepted as a simple method to classify medical risk by weight status (WHO,1998, NHLBI Expert Panel,2002, US Department of Health and Human Services , 2000). This index provides a measure of the relation between height and weight and correlates with percentage body fat in young and middle-aged adults (Willett WC et al, 1999).

Although it has been suggested that the use of alternative methods to estimate height, such as knee height (Prothro et al, 1993) or arm span (Kwok et al, 1991), may provide more reliable estimates of BMI, these approaches have not been adequately validated. Another limitation of using BMI to estimate disease risk is the effect of aging on fat distribution. Visceral fat (omental and mesenteric adipose tissue), subcutaneous abdominal fat, intramuscular fat, and intrahepatic fat, which are risk factors for insulin resistance and metabolic diseases, increase with aging (Beaufriere et al, 2000). Therefore, the size of these depots is likely greater in older than in young adults at any given BMI value.

The prevalence of obesity (defined as a BMI ≥ 30) in all age categories has increased during the past 25 y in the United States (Flegal et al, 1998, Hedley et al, 2004, Kuczmarski et al, 1994). The number of obese older persons has markedly increased because of both an increase in the total number of older persons and in the percentage of the older population that is obese. In 1991, 14.7% of persons in the United States who were 60–69 y of age and 11.4% of those who were >70 y old were obese (Mokdad et al, 1999). In 2000, the prevalence of obesity in these age groups increased to 22.9% and 15.5%, respectively, which represents increases of 56% and 36%, respectively, in <10 y (Mokdad et al, 2001).

MATERIAL AND METHOD

The study group consisted of 438 elderly subjects (267 female and 171 male) aged above 60 years.

In all we measured weight, height, body mass index (BMI), waist circumference (WC), blood pressure and we evaluated: lipid profile (total cholesterol, triglyceride, HDL cholesterol, and LDL cholesterol) and fasting glucose.

The criteria used to identify obesity in elderly were:

- waist circumference (above 80 cm in women and above 94 cm in men)
- BMI above 30 kg/m^2 , with the following interpretation: BMI between 30 and 34.9 kg/m^2 - obesity grade I; between 35 and 39.9 kg/m^2 - obesity grade II; over 40 kg/m^2 – obesity grade III; between 25 and 29.9 kg/m^2 – overweight.

The methods of investigation were represented by **clinical data** - case history, current status, evaluation of nutrition with questionnaire method, **anthropometric measurements**: waist circumference and body mass index (BMI), **determination of systolic and diastolic blood pressure**, **biochemical** - for glycemic balance: fasting blood glucose, for lipid metabolism: total cholesterol, triglycerides, HDL cholesterol, LDL cholesterol.

Questionnaire method

The questionnaire consisted of 45 questions in order to identify:

- a) family history of cardiovascular disease
- b) associated risk factors with cardiovascular disease such as smoking, sedentary lifestyle, unhealthy diet, psychosocial stress.

To assess the level of stress was used Perceived Stress Questionnaire.

Evaluation of nutrition

The subjects completed a questionnaire (Table 1) that included data on weekly frequency of breakfast, daily consumption of bread/cereals, fruits/vegetables, weekly consumption of foods with high fat, cholesterol and refined carbohydrates.

Table 1. Questionnaire to assess the nutrition (MacLean, 2000; De Backer, 2003)

1. Breakfast: How many times a week serving a hearty breakfast (more than just a coffee with a frugal meal)?
2. Bread/Grain: How many portions of whole grain bread and whole grains you eat daily? (One portion = 1 piece of bread, 2/3 cup with dry cereal, ½ cup with cooking cereals etc.)
3. Fruits/vegetables: how many portions of fruits and vegetables consumed daily? (One portion = 1 medium fruit, 2/3 cup with juice fruits/vegetables, 1 cup with fruit/raw vegetables, ½ cup with cooked fruit and vegetables, etc..)
4. Foods with high fat and cholesterol: how many times a week consume grilled steak, hamburger, hot dogs, sausages, forcemeat balls, bacon, cream cheese, fries, fried chicken, butter, cream, fat cheese, ice-cream, greasy creams etc.
5. Foods containing increased refined carbohydrates: how many times a week consume soft drinks (Coke, Fanta etc.) fast food, refined grains (white bread, husked rice), bakery products, candy, etc..

Determination of blood pressure (BP)

Blood pressure was measured using conventional sphygmomanometers (Didytest, Germany), respecting following conditions: "fasting", subject seated with left arm raised to the heart, physical rest for at least 5-10 min without the subjects smoke or drink coffee before the determination (De Backer, 2003). The studied values were arithmetic mean of BP values obtained by three successive determinations.

Investigation of glycemic balance

Determination of plasma glucose was performed by enzyme technique with glucosooxidasis. Normal values were taken between 70 - 110 mg%; diabetes mellitus - values equal or over 126 mg%, impaired glucose tolerance - values between 110 - 125 mg% and the OGTT at 2 h between 140 - 200 mg% and impaired fasting glucose - values between 110 - 125 mg% and OGTT at 2 h under 140 mg%.

Investigation of lipid metabolism

The "fasting" lipid profile in the peripheral blood was appreciated by determining the total cholesterol (TC), triglyceride (TG), HDL-cholesterol (HDL-C), LDL-cholesterol (LDL-C) and the ratio TC/HDL-C. We used laboratory methods based on the enzyme principle, both for TC (Dimension AR, Dade Behring Inc., USA) and TG and HDL-C (REflectron IV, Roche, Switzerland). The level of LDL-C was calculated according to the Friedwald's formula: $LDL = TC - (HDL + TG/5)$. Were considered normal: TC < 200 mg%, TG < 150 mg%, HDL-C > 45 mg%, LDL-C < 115 mg%, TC/HDL-C between 2 - 3.5.

Determination of body mass index (BMI) and waist circumference (WC)

We determined the subjects body weight (kg) and waist (m) and we calculate BMI according to the formula: $BMI (kg/m^2) = \text{body weight}/\text{height}^2$. The results were interpreted as follows: normal (18.5 to 24.9 kg/m^2), overweight (25 to 29.9 kg/m^2), obesity grade I (30 to 34.9 kg/m^2), obesity grade II (35 to 39.9 kg/m^2), obesity grade III (> 40 kg/m^2), underweight (<18.5 kg/m^2). (MacLean, 2000; De Backer, 2003)

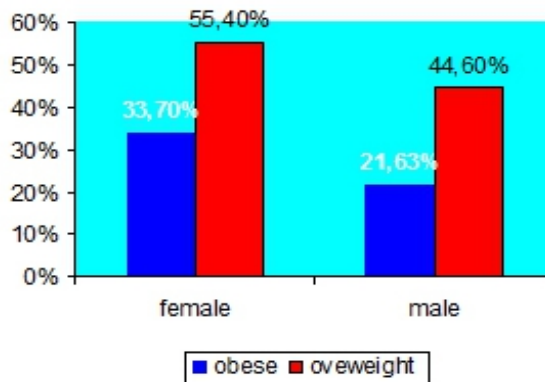
Waist circumference was determined with a centimeter by measuring the waist at the half distance between the umbilicus and xiphoid appendix.

STATISTICAL ANALYSIS

For statistical analysis we used Microsoft Excel and POP Tools from Microsoft Office 2003 and EPI 2000 program. To measure the quantitative variables were determined media (M) and standard deviation (SD), and to assess the gender differences we used the unpaired t test and ANOVA test, considering statistically significant a $p < 0.05$.

RESULTS AND DISCUSSION

From a group of 438 elderly subjects (267 female and 171 male) aged above 60 years, 29% had BMI above 30 kg/m^2 (33.7% F and 21.63% M, $p=0.006$, $X^2=7.38$). 3.2% had BMI < 18.5 kg/m^2 , 34.01% had BMI between 18.5 and 24.9 kg/m^2 , and 33.79% BMI between 25 and 29.9 kg/m^2 (55.4% F and 44.6% M, $p=0.06$, $X^2=7.38$).

Fig.1. Prevalence of obesity and overweight by sex at elderly

Regarding the age group, the prevalence of obesity was higher between 60 – 70 years (47.24%) and lower > 80 years (25.76%). We obtain significant differences regarding age group between 60 – 70 years with > 80 years (47.24% vs. 25.76%, $p < 0.001$, $X^2 = 29.2$) and between 70 – 80 years with > 80 years (37% vs. 25.76%, $p = 0.0001$, $X^2 = 14.78$), but not between 60 – 70 years with 70 – 80 years (47.24% vs. 37%, $p = 0.09$, $X^2 = 2.73$).

Table II. Prevalence of obesity according to age group at elderly

Age group	Obesity
60 – 70 years	47.24%
71 – 80 years	37%
> 80 years	25.76%

Few studies have investigated the frequency and distribution of overweight and obesity in the elderly population, especially in samples representative of entire countries. A study carried out in Jerusalem (Gofin et al, 1996), in persons ≥ 50 years of age, showed high prevalences of overweight and obesity: 16% of men and 33% of women had a BMI ≥ 30 kg/m², whereas 41% and 57% of men and women, respectively, had a BMI ≥ 27 kg/m². Somewhat lower prevalence of overweight and obesity were found in a sample of the population ≥ 65 years of age in Taiwan (Chiu et al, 2000), where 30.5% of men and 41.3% of women had a BMI ≥ 25 kg/m².

The Third National Health and Nutrition Examination Survey (NHANES III) in the United States showed that 70% of men 60 to 69 years of age and 64% of women in this age group were overweight or obese (Flegal et al, 1998). 1999–2000 continuous NHANES showed that 38% of men and 42% of women 60 to 69 years of age were obese (Flegal et al, 2002). Likewise, high prevalence of overweight and obesity were observed in Finland (Lahti-Koski et al, 2000), where 81% of men and 73% of women

55 to 64 years of age had a BMI ≥ 25 kg/m² in 1997. In Germany (Hoffmeister et al, 1994), in 1994, 24% of men 60 to 69 years of age and 31% of women in this age group had a BMI ≥ 30 kg/m². In France, in 1991, 64% of men and 50% of women ≥ 60 years of age were overweight or obese (Maillard et al, 1999). According to the health survey in England (combined data for 1991 and 1992), the percentages of men and women from 65 to 74 years of age with a BMI ≥ 25 kg/m² were 62% and 60%, respectively (Breeze et al, 1994). Higher prevalence, close to those found in the present study, were found in the south of Italy (Barbagallo et al, 2001), where 76% of men and 86% of women 60 to 69 years of age had a BMI ≥ 25 kg/m², and in a study in an urban Palestinian population (Abdul-Rahim et al, 2001), where the prevalence of overweight or obesity in persons 55 to 65 years of age was 74% in men and 88% in women.

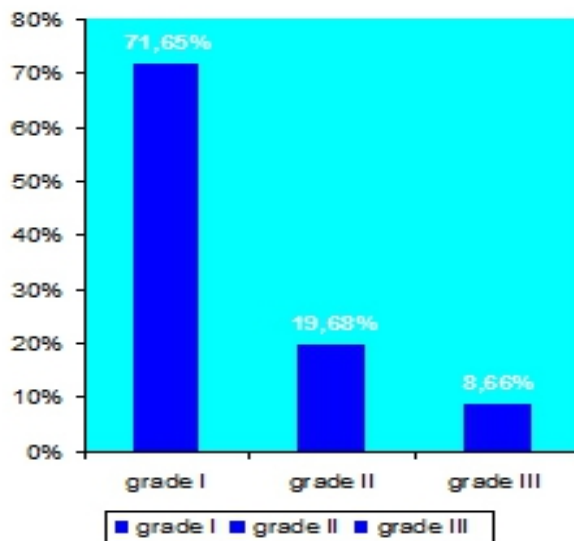
In a study performed in India it was found that 34% of men and 40.3% of women were overweight and obese (Singh et al, 2004).

A study performed in Spain shows that 49% of men and 39.8% of women were overweight. Except for men ≥ 80 years of age, the prevalence of overweight was lower in people ≥ 80 years of age than in younger participants. The prevalence of obesity was 31.5% in men and 40.8% in women. In both sexes, this prevalence was lower in older people: decreasing from 35% in men 60 to 69 years of age to 19.4% in those ≥ 80 years of age; and decreasing from 43.8% in women 60 to 69 years of age to 29.2% in those ≥ 80 years of age. All together, 80.5% of men and 80.6% of women were either overweight or obese. (Gutiérrez-Fisac et al, 2004)

In other studies (Flegal et al, 1998; Barbagallo et al, 2001; Flegal et al, 2002), the prevalence of overweight was higher in men, whereas that of obesity was higher in women. This could be due to the fact that men have a larger relative amount of lean mass in comparison to women, together with the fact that women have a greater tendency to accumulate fat, the same as occurs in the non elderly population.

The highest prevalence of obesity was found among women, which was also observed in other studies (Kissebah et al, 1994; Tavares et al, 1999). This can be explained by the fact that women store more fat in the postprandial period, even if they consume fewer calories (O'Sullivan, 2009). In contrast, women tend to metabolize a higher percentage of fat during physical activity than men (Tarnopolsky, 2008).

In function of obesity grade, 71.65% had obesity grade I (65.93% F and 34.07% M, $p < 0.001$, $X^2 = 18.48$), 19.68% obesity grade II (80% F and 20% M, $p < 0.001$, $X^2 = 18$ and 8.66% obesity grade III (90.9% F and 9.1% M, $p < 0.001$, $X^2 = 14.73$).

Fig.2. Prevalence of obesity grade at elderly**Table III. Prevalence of obesity grade at elderly**

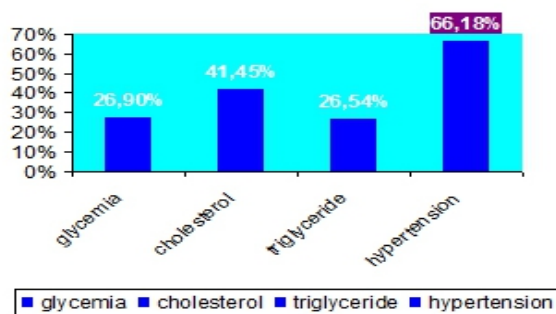
Obesity grade	F	M	p
I	65.93%	34.07%	< 0.001
II	80%	20%	< 0.001
III	90.9%	9.1%	< 0.001

In function of obesity type, prevailed android obesity. From female, 84.25% presented android type and 22.23% gynoid type ($p < 0.001$, $X^2 = 55.56$). In the case of male, all presented android type (100%).

Table IV. Obesity type at elderly

Type of obesity	Android	Gynoid
Total	84.25%	15.75%
Female	77.77%	22.23%
Male	100%	0%

For obese and overweight subjects, 26.9% had fasting glycemia above 100 mg%, 41.45% had higher concentration of total cholesterol, 26.54% had higher concentration of triglyceride, and 66.18% had hypertension.

Fig.3. Prevalence of other cardiovascular risk factors at obese and overweight elderly

Obesity causes serious medical complications, which lead to considerable morbidity, impaired quality of life, and premature death.

The prevalence of many of the medical complications associated with obesity - such as hypertension, diabetes, cardiovascular disease, and osteoarthritis - increases with age.

All components of the metabolic syndrome (excess abdominal fat, insulin-resistant glucose metabolism, dyslipidemia, and high blood pressure) (National Institutes of Health, 2001) are prevalent in older populations.

Fasting plasma glucose increases by 1–2 mg/dL and postprandial glucose by 10–20 mg/dL for each decade after age 30 y (Kahn et al, 1991).

Hypertension is common in the older population, affecting ≈30–50% of all persons aged >65 y (Applegate, 1992).

Obesity is also responsible for the increase in type 2 diabetes, 90% of patients with type 2 diabetes being diabetics. The risk for developing diabetes increases with increasing BMI (risk is 40-80 times higher at a BMI > 40 kg/m² to a BMI <21 kg/m²). Furthermore, overweight (BMI > 25 kg/m²) occurs in 64% of cases in men and 74% of the cases in women (Wilding, 2003).

Although obesity is a risk factor for developing diabetes, only 50% of obese develop diabetes (Wilding, 2003).

Dyslipidemia (i.e., low HDL-cholesterol and high serum triacylglycerol concentrations) is associated with abdominal obesity in both young and old adults (Pouliot et al, 1992, Despres, 1994, Mykkanen et al, 1994). Data from longitudinal population studies suggest that obesity increases the risk of cardiovascular disease in older men, but not necessarily in older women. Increased BMI in older men was associated with an increase in new cases of coronary heart disease (Harris et al, 1997), fatal and nonfatal myocardial infarction (Dey et al, 2003), and cardiovascular disease mortality (Stevens et al, 1998) during 12–15 y of subsequent observation. However, no increased cardiovascular disease risk was observed in obese older women in

some (Stevens et al, 1998, Dey et al, 2003), but not all (Folsom et al, 2000), studies.

Conclusion

At elderly we have a predominance of obesity at female. In function of obesity grade and type, we have a predominance of obesity grade I, android type. Because of association with other cardiovascular risk factors it's imposed early measures for decreased obesity prevalence and changing lifestyle.

Many studies that aim to determine the cut-off points for obesity in the elderly are based on mortality risk, which in this population may not be the best criterion. It should be highlighted that mortality rates can also increase among underweight elderly. In addition, old people with normal BMI may accumulate abdominal fat, increasing the mortality rates among this population.

The most important thing is to make a diagnosis of obesity at an early stage so that the associated comorbidities can be reduced. Moreover, because there is a correlation with morbidity and mortality rates, because there is no standard method for the assessment of obesity in the elderly, the BMI remains a good indicator of the nutritional status of the elderly.

In addition, frequent monitoring, with longitudinal assessments and obesity prevention is of utmost importance to avoid comorbidities, reduce activity limitations and improve the quality of life of elderly people.

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